REMARKS

Claims 1-34 are pending. Claims 1-13 have been withdrawn from consideration. By this Amendment, Claims 21 and 23 are amended. Reconsideration of the May 22, 2002 Official Action is respectfully requested.

Applicants thank Examiner Uhlir for the courtesies extended to Applicants' undersigned representative during the personal interview on August 6, 2002.

It is gratefully acknowledged that Claims 23 and 24 have been indicated to be allowable. Claim 23 has been rewritten in independent form. Accordingly, Claim 23 and dependent Claim 24 are allowable. However, for the reasons stated below, Applicants respectfully submit that all pending claims are allowable.

Claims 14, 15, 18, 19, 26 and 33 were rejected under 35 U.S.C. § 102(b) over U.S. Patent No. 5,302,420) to Nguyen et al. ("Nguyen"). The reasons for the rejection are stated at numbered paragraphs 2 and 3 at pages 2-3 of the Official Action. The rejection is respectfully traversed.

Claim 14 recites "a component of a plasma reactor, the component having one or more surfaces exposed to the plasma during processing, the component comprising an <u>as-sprayed plasma sprayed coating</u> on a plasma exposed surface of the component, wherein the coating has an <u>as-sprayed surface roughness</u> that promotes the adhesion of polymer deposits" (emphasis added). It is asserted in the Official Action that the term "as sprayed roughness" is a process limitation and does not appear to be further limiting to the structure of the claimed product. Regarding the recitation in Claim 14 of "a surface roughness that promotes the adhesion of polymer deposits," it is further asserted that "because the

fluoropolymer taught by Nguyen et al. is a plasma deposited coating, it is deemed to necessarily meet this limitation" (emphasis added). Applicants respectfully disagree with these assertions.

As discussed during the August 6, 2002 personal interview, the term "as-sprayed surface roughness" is not a process limitation, but rather is a structural feature of the claimed component. Particularly, because this term describes the product more by its structure than by the process used to obtain it, it is a product feature. See, e.g., Hazani v. U.S. International Trade Commission, 44 USPQ2d 1358 (Fed. Cir. 1997) and In re Garnero, 162 USPQ 221, 223 (CCPA 1969), which was described in the Amendment filed on April 19, 2002. In Hazani, the court determined that the term "chemically engraved" is a product limitation. Clearly, in view of Garnero the claimed term "as-sprayed surface roughness" is a product feature. As was further discussed during the personal interview, Nguyen does not disclose the formation of a coating having the structural features of the claimed as-sprayed plasma sprayed coating.

Nguyen discloses the formation of a fluorocarbon polymer film 13 on chamber walls and electrodes (see col. 3, lines 7-9 and the figure). The film 13 is not plasma sprayed. Instead, the film is formed by plasma enhanced chemical vapor deposition (PECVD) (see the Abstract). As discussed during the personal interview, no basis was provided in the Official Action for the assertion that the PECVD film of Nguyen "necessarily" has the same structure as the claimed as-sprayed plasma sprayed coating, including "a surface roughness that promotes the adhesion of polymer deposits". It was

agreed that plasma spraying results in a different material coating than PECVD and thus that Nguyen does not anticipate Claim 14, as reflected in the Interview Summary.

In order for a reference to anticipate a claim based on an inherent disclosure, the alleged inherent subject matter in the reference must be a necessary result and not merely a possible result. In re Oelrich, 212 USPQ 323 (CCPA 1981). The Official Action fails to establish that Nguyen's PECVD film would necessarily have the same structure, including the same surface roughness, as the as-sprayed plasma sprayed coating recited in Claim 14.

As discussed during the personal interview, plasma spraying and PECVD are different processes that produce different structural features. As evidence of such different structural features that are formed by these two processes, attached hereto are scientific publications that were discussed during the personal interview. The publication by Richard Knight and Ronald W. Smith entitled "Thermal Spray Forming of Materials", ASM International, pp. 408-413 (1998), describes thermal spray forming processes including plasma spraying. Plasma spray processes use a plasma to form droplets, which impinge upon a substrate to form a coating. An as-sprayed, thermally sprayed metal deposit is depicted in Fig. 5 at page 411 of Knight. The as-sprayed plasma sprayed coating includes flattened splats, unmelted particles and recrystallized regions, and has a rough surface. A typical as-sprayed microstructure of a plasma sprayed ceramic material is shown in Fig. 6. As described at page 412, first full paragraph of Knight, the ceramic coating includes fine grains and a lamellar structure. Attached U.S. Patent No. 6,294,261 to Sangeeta et al. discloses at col. 1, lines 59-62, that "a plasma-sprayed coating often has a relatively rough

surface, e.g., an 'Ra' (center-line average roughness) greater than about 8 microns" (emphasis added).

PECVD and chemical vapor deposition (CVD) coatings are structurally different than plasma sprayed coatings. In CVD processes, films are formed by atoms in the vapor coming into contact with a surface and forming bonds with the surface. PECVD processes use a plasma to generate ions or radicals that recombine to give the desired film by chemical vapor deposition. C.R.M. Grovenor, "Microelectronic Materials", Institute of Physics Publishing, Bristol, pp. 159-162 (1994) is attached. As described at page 160, third full paragraph, a deposit will form on the walls of a CVD reactor that is likely to be smooth, even and conformal.

The foregoing establishes that the as-sprayed plasma sprayed coating as recited in Claim 14 and the PECVD coating disclosed by Nguyen have different structures, in that the PECVD coating would not exhibit the claimed surface roughness property.

Accordingly, because Nguyen does not disclose the combination of features recited in Claim 14, Claim 14 is patentable. Dependent Claims 15, 18, 19, 26 and 33 thus are also patentable for at least the same reasons as Claim 14. Withdrawal of the rejection is therefore respectfully requested.

Claims 14-22, 25-32 and 34 were rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 6,120,640 to Shih et al. ("Shih") in view of U.S. Patent No. 5,993,594 to Wicker et al. ("Wicker") and further in view of U.S. Patent No. 5,916,454 to Richardson et al. ("Richardson"). The reasons for the rejection are stated at numbered paragraph 2 at pages 3-7 of the Official Action. The rejection is respectfully traversed.

It was acknowledged in the Official Action that Shih fails to teach a plasma reactor component that has surface roughness characteristics that promote adhesion of polymer deposits. However, it was asserted that Richardson teaches a method for manufacturing a plasma reactor chamber part, in which the part is roughened to promote adhesion of byproduct particles to the surface of the part. It was further alleged in the Official Action that it would have been obvious to impart the rough surface taught by Richardson to the boron carbide coated reactor chamber components disclosed by Shih. Applicants respectfully disagree with these assertions.

Shih discloses the use of sintered boron carbide without a coating, and boron carbide coatings (and silicon nitride coatings, see col. 10, lines 50-52) on aluminum-based materials (col. 11, lines 44-52). Shih discloses that sintered boron carbide and boron carbide coatings provide improved erosion rates when subjected especially to BCl_3. Shih discloses that anodized aluminum chamber walls are strongly etched by BCl_3 plasma and that the boron carbide coatings address this specific problem.

As explained in the Amendment filed on April 19, 2002, Shih does not disclose that the boron carbide coatings reduce the problem of contamination caused by the peeling off of polymer deposits from plasma exposed surfaces of plasma reactors. Applicants discovered that the as-sprayed plasma sprayed coating as recited in Claim 14 can unexpectedly reduce this problem. See page 14, last paragraph, of the present specification. It was discovered that polymer deposits formed on the plasma sprayed coatings strongly adhere to the claimed plasma sprayed coatings and thus reduce particulate contamination.

Furthermore, Shih teaches away from the claimed invention because Shih seeks to provide a smooth surface. For example, Shih discloses that boron carbide spray coatings applied over a roughened anodized surface have a relatively smooth surface relative to that of the roughened surface (col. 9, lines 21-22), and that coatings having a bumpy surface should be polished to provide "a much smoother surface" (emphasis added, see the paragraph bridging cols. 9 and 10). Accordingly, it is submitted that a person of ordinary skill in the art would not have been motivated to use a plasma sprayed coating with the claimed surface roughness property in view of Shih's teaching to polish any bumpy surface.

Richardson does not suggest forming an as-sprayed plasma sprayed coating that "has an as-sprayed surface roughness that promotes the adhesion of polymer deposits", as recited in Claim 14. Accordingly, Richardson fails to cure the deficiencies of Shih. Shih does not disclose any problem of polymer deposits either forming on or dislodging from a component in Shih's plasma reactor. Accordingly, the Official Action fails to provide sufficient motivation for modifying Shih's plasma reactor in view of Richardson. Moreover, Richardson discloses various surface roughening treatments, while Shih discloses various surface smoothing treatments. Shih discloses that a smooth surface is desired, and performs additional process steps to smooth relatively rougher surfaces to obtain a smooth surface. Thus, the references teach away from the claimed plasma sprayed coating.

Wicker is cited for the disclosure of using hydrofluorocarbons as the processing gas to etch silicon. However, that disclosure fails to cure the above-described deficiencies of Shih and Richardson with respect to the component recited in Claim 14.

Therefore, Claim 14 is patentable over the cited references. Claims 15-20, 22 and 25-32 depend from Claim 14 and thus are also patentable for at least the same reasons as Claim 14.

Claim 21 has been rewritten in independent form. Shih teaches away from the combination of features recited in Claim 21, which recites that the component and the coating material comprise the same ceramic material. As explained at page 8, line 25 to page 9, line 5 of the specification, using the same ceramic material can minimize or eliminate differences in the coefficient of thermal expansion, thereby reducing exfoliation.

Shih discloses forming boron carbide coatings (i.e., ceramic coatings) on aluminum-based substrates. At col. 4, lines 6-14, Shih discloses that BCl_3 plasma causes a strong alumina etch rate. Shih addresses this particular problem by using sintered boron carbide or alternatively boron carbide coatings on aluminum-based substrates. Both of these two approaches provide the same maximum erosion rate of < 0.025 microns/hr (TABLE 2 at col. 10). Accordingly, Shih provides no suggestion to apply a boron carbide coating on a sintered boron carbide body because the resulting coated sintered body would have the same erosion rate as the sintered body itself. Thus, Shih provides no motivation to make this modification.

Richardson and Wicker fail to cure the deficiencies of Shih with respect to the subject matter of Claim 21. Accordingly, Claim 21 is also patentable.

Regarding independent Claim 34, as explained above, Shih discloses performing smoothing steps to modify rougher surfaces. Richardson does not disclose forming roughened surfaces of chamber parts by plasma spraying, but rather discloses roughening existing surfaces by other techniques (col. 5, line 63 to col. 6, line 32). The Official Action did not establish that modifying Shih's coating according to Richardson's roughening techniques would result in a coating having the same structure as an as-sprayed plasma sprayed coating, i.e., a plasma sprayed coating that has not been subjected to subsequent process steps, such as roughening steps. Accordingly, Shih and Richardson do not suggest a product that results from the process recited in Claim 34, which consists essentially of plasma spraying a coating material on a plasma exposed surface of a component. Wicker does not cure the deficiencies of Shih and Richardson. Accordingly, Claim 34 is also patentable.

For the foregoing reasons, Applicants respectfully submit that the application is in condition for allowance and such action is earnestly solicited.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By: Edward A. Brown

Edward A. Brown
Registration No. 35,033

P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620

Date: August 22, 2002

Attachment to Amendment dated August 22, 2002

Marked-up Claims 21 and 23

21. (Amended) [The method of claim 20, wherein the component and the coating material comprise the same ceramic material.] A component of a plasma reactor, the component having one or more surfaces exposed to the plasma during processing, the component comprising an as-sprayed plasma sprayed coating on a plasma exposed surface of the component, the component and the coating both comprising the same ceramic material selected from the group consisting of alumina, yttria, zirconia, silicon carbide, silicon nitride, boron carbide and boron nitride, and the coating having an as-sprayed surface roughness that promotes the adhesion of polymer deposits.

23. (Amended) [The component of claim 19, wherein the coating is a polyimide.] A component of a plasma reactor, the component having one or more surfaces exposed to the plasma during processing, the component comprising an as-sprayed plasma sprayed polyimide coating on a plasma exposed surface of the component, wherein the coating has an as-sprayed surface roughness that promotes the adhesion of polymer deposits.